PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventor: GEORGE CAMAC

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International Classification: —**F06l.**

COMPLETE SPECIFICATION

Improvements relating to Gas Tight Couplings

We, A. E. I.—JOHN THOMPSON NUCLEAR ENERGY COMPANY LIMITED, a British Company having its registered office at Crown House, Aldwych, London, W.C.2, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to gas tight couplings and is more particularly concerned with apparatus for making a temporary gas tight coupling.

The invention has an important application *inter alia* in nuclear reactors which have a gas coolant and may be employed for coupling apparatus for gaining access to a fuel channel without causing appreciable loss of coolant gas from the fuel channel. Examples of such requirements are in the apparatus described in co-pending Application No. 6586/57 (Serial No. 854,764) in which it may be used when connecting the chute mechanism or the charging mechanism, as described therein.

The invention, however, is not limited to nuclear reactors but has other uses where a temporary gas tight coupling has to be made quickly.

According to the present invention a pair of ducts to be coupled are provided with chamfered mating surfaces adapted to form an annular joint when abutting, servo apparatus carried on one of the ducts and adapted to operate hook members to engage a flange collar, or the like on the other duct so as to draw it into abutment with the first duct together with channelling extending around at least one of the annular mating surfaces and means for feeding gas under pressure to said channelling when the joint is made and means responsive to the gas pressure produced in said channelling to indicate the efficiency of the seal and/or initiate a control action in the event of failure of the seal.

In apparatus embodying the invention there may be a number of servo devices distributed around one of the duct ends, each servo device operating one or more hook members to engage a flange on the second duct.

According to a preferred embodiment the hook members are arranged in pairs each operated by the same servo device.

In order that the invention may be more clearly understood reference will now be made to the drawings accompanying the provisional specification, in which:—

Figs. 1 and 2 show general views of joints embodying the invention.

Fig. 3 shows the arrangement of the leakage indicating apparatus.

Fig. 4 is a detail view to an enlarged scale of one of the hook devices in the disengaged position.

Fig. 5 is a side view of the device shown in Fig. 6.

Fig. 6 is a view corresponding to Fig. 4 showing the apparatus in the engaged position.

Fig. 7 is a detail view being a part section on the line VII—VII of Fig. 5.

Fig. 8 is a detail perspective view showing the arrangement of the supply ducts to the servo cylinders.

Referring first to Fig. 1 the reference 1 indicates one of the ducts which is formed with a coupling flange 2 whilst 3 is the other duct which is similarly formed with a coupling flange 4. The flanges 2 and 4 are clamped together by a number of clamping devices 5 which are distributed around the joint. These are mounted on the first duct 1 and operate hook members 6 which engage with the under surface of the lower flange 4 so as to draw this upwards against the top flange and make the joint. The clamp

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devices are operated by servo motors fed through supply pipes 7, 8 which extend annularly around the coupling and are connected through pipes 9 and 10 respectively to a control valve 11.

Fig. 2 shows two couplings, indicated by the references 12 and 13 each of which is similar to the coupling shown in Fig. 1. In the case of the top coupling 12 the servo elements are mounted on the duct 14 and the hooks engage a flange 15 whilst similarly the lower coupling 13 comprises servo elements mounted on a duct 16 and engaging a flange 17. The two flanges 15 and 17 are coupled together by a length of flexible hosing 18. The two couplings are independently operated from control valves indicated by the rectangles 11 and 11^1 respectively.

Fig. 3 shows the arrangement of Fig. 1 in greater detail. The joint surface between the two flanges is indicated by the line 19; jointing seals 20 are provided in this surface. At the same time an annular channel 21 extends around the mating face on the end of the flange 2 of duct 1. When the joint is made this channel is charged with gas from a supply 22 through a valve 23, the valve is then closed and the pressure is then observed on a gauge 24. If the joint is correctly made and there is no excess leakage then the pressure will be maintained. If, however, there is excess leakage and the joint is incorrectly made then the resulting drop in pressure will be shown by the indicator 24. As an alternative to the indicator, or in addition thereto, alarm apparatus may be provided and in the case of a coupling to a reactor fuel channel, as above described, safety apparatus may prevent opening of the coupling or if leakage should develop whilst the operation is being carried out then safety apparatus may be actuated whereby any parts inserted, such as fuel grabs, may be automatically and immediately removed from the fuel channel.

In the arrangement shown in Figs. 4—7 the flanges of the two pipes to be coupled are held together by hook members which are distributed around the coupling and arranged in pairs each pair being operated by a separate servo device. The hook members, indicated by the reference 26, are pivoted at 27 on brackets 28 projecting from the upper flange 2. The hook members 26 are provided with adjustable stops 29 which, as shown in Fig. 6, engage the flange 4. The hook members are also coupled by way of links 30 with the plates 31 which are pivoted at 32 on brackets 33 projecting from the duct walling 1. Servo devices 34 are pivoted at 35 on the ends of the brackets 28; these servo devices have plungers 36 which are coupled through rods 37 with the plates 31 to which they are pivoted at 38.

It will be observed that the plunger 36 is formed with a passage 39 which couples with a flexible supply duct 40 at the junction point 41. This enables pressure to be applied to the underneath of the plunger 36 in a more convenient manner since it will be appreciated that the servo device has to pivot a slight amount between the position shown in Figs. 4 and 6. Pressure to the upper side of the piston 36 is applied through a second flexible pipe 42, shown in Fig. 7, which does not appear in Fig. 5 as it is immediately behind the rod 37.

Fig. 8 shows how the supply ducts to the servo mechanism are arranged. It will be observed that the flexible pipe 40 shown in Fig. 5 actually constitutes the line 7 of Fig. 1.

Clearly modifications can be introduced, for instance, the hook member 26 could comprise a pair of interconnected members in different axial planes, one member being pivoted to the link 30 and the other carrying the stop 29. Moreover, the linkage could be so arranged that in moving between the Fig. 4 and Fig. 6 position the pin joining plate 31 and link 30 moves over a dead centre so that the joint will be held in engagement without the necessity for maintaining the fluid pressure in the servo motor. In such a case resilience may be introduced, for instance, the hook member 26 could be replaced by a pair of members as above described one of which is slightly resilient or the link 30 could be made longitudinally resilient, e.g. of a pair of telescopic members spring pressed apart.

WHAT WE CLAIM IS:—

1. A coupling between a pair of ducts comprising chamfered mating surfaces extending around the ends of the ducts adapted to form an annular joint when abutting, servo apparatus carried on one of the ducts and adapted to operate hook members to engage a flange, collar or the like on the other duct so as to draw it into abutment with the first duct, together with channelling extending around at least one of the annular mating surfaces and means for feeding gas under pressure to said channelling when the joint is made and means responsive to the gas pressure produced in said channelling to indicate the efficiency of the seal and/or initiate operation of safety apparatus in the event of failure of the seal.

2. A coupling as claimed in Claim 1 in which there are a number of servo devices distributed around one of the duct ends, each servo device operating one or more hook members to engage a flange on the second duct.

3. A coupling as claimed in Claim 2 in which the hook members are arranged in pairs, both hook members of each pair being operated by the same servo device.

4. In a gas cooled nuclear reactor a gas

tight connection between a duct in a fuel charging machine and a fuel channel comprising a length of flexible hose through which the fuel elements pass, a disconnectible coupling at one end of the hose adapted for coupling the hose to a fuel channel in the reactor and a disconnectible coupling at the other end of the hose adapted for coupling the hose to the charging machine, each of said couplings being as claimed in any one of the preceding claims.

5. A gas tight coupling for coupling a charging machine to a fuel channel of a nuclear reactor substantially as herein described with reference to the drawings accompanying the provisional specification.

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Crown House, Aldwych,
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Agent for the Applicants.

PROVISIONAL SPECIFICATION

Improvements relating to Gas Tight Couplings

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This invention relates to gas tight couplings and is more particularly concerned with apparatus for making a temporary gas tight coupling.

The invention has an important application *inter alia* in nuclear reactors which have a gas coolant and may be employed for coupling apparatus for gaining access to a fuel channel without causing appreciable loss of coolant gas from the fuel channel. Examples of such requirements are in the apparatus described in co-pending Aplication No. 6586/57 (Serial No. 854,764) in which it may be used when connecting the chute mechanism or the charging mechanism, as described therein.

The invention, however, is not limited to nuclear reactors but has other uses where a temporary gas tight coupling has to be made quickly.

According to the present invention a pair of ducts to be coupled are provided with chamfered mating surfaces adapted to form an annular joint when abutting, servo apparatus carried on one of the ducts and adapted to operate hook members to engage a flange collar or the like, on the other duct so as to draw it into abutment together with channelling extending around at least one of the annular mating surfaces and means for feeding gas under pressure to said channelling when the joint is made and means for observing the gas pressure produced in said channelling to determine the efficiency of the seal.

In apparatus embodying the invention there may be a number of servo devices distributed around one of the duct ends each operating one or more hook members to engage a flange on the alternate duct.

According to a preferred embodiment the hook members are arranged in pairs each operated by the same servo device.

In order that the invention may be more clearly understood reference will now be made to the accompanying drawings, in which:—

Figs. 1 and 2 show general views of joints embodying the invention.

Fig. 3 shows the arrangement of the leakage indicating apparatus.

Fig. 4 is a detail view to an enlarged scale of one of the hook devices in the disengaged position.

Fig. 5 is a side view of the device shown in Fig. 6.

Fig. 6 is a view corresponding to Fig. 4 showing the apparatus in the engaged position.

Fig. 7 is a detail view being a part section on the line VII—VII of Fig. 5.

Fig. 8 is a detail perspective view showing the arrangement of the supply ducts to the servo cylinders.

Referring first to Fig. 1 the reference 1 indicates one of the ducts which is formed with a coupling flange 2 whilst 3 is the alternate flange which is similarly formed with a coupling flange 4. The flanges 2 and 4 are clamped together by a number of clamping devices 5 which are distributed around the joint. These are mounted on the duct 1 and operate hook members 6 which engage on the under surface of the lower flange 4 so as to draw this upwards against the top flange and make the joint. The servo motors are operated through supply pipes 7, 8 and extend annularly around the coupling and are connected through pipes 9 and 10 respectively to a control valve 11.

Fig. 2 shows two couplings, indicated by the references 12 and 13 each of which is similar to the coupling shown in Fig. 1. In the case of the top coupling 12 the servo elements are mounted on the duct 14 and the hooks engage a flange 15 whilst similarly the lower coupling 13 comprises servo elements mounted on a duct 16 and engaging a flange 17. The two flanges 15 and 17 are coupled together by a length of flexible hosing 18. The two couplings are independently operated from control

valves indicated by the rectangles 11 and 11^1 respectively.

Fig. 3 shows the arrangement of Fig. 1 in greater detail. The joint surface between the two flanges is indicated by the line 19, the jointing seals 20 are provided in this surface. At the same time an annular channel 21 extends around the mating face on the end of the flange 2 of duct 1. When the joint is made this is charged with gas from a supply 22 through a valve 23, the valve is then closed and the pressure is then observed on a gauge 24. If the joint is correctly made and there is no excess leakage then the pressure will be maintained. If, however, there is excess leakage and the joint is incorrectly made then the resulting drop in pressure will be shown by the indicator 24. As an alternative to the indicator, or in addition thereto, alarm apparatus may be provided and in the case of a coupling to a reactor fuel channel, as above described, control apparatus may prevent opening of the valve or if leakage should develop whilst the operation is being carried out then any parts inserted, such as fuel grabs, may be automatically and immediately removed from the fuel channel.

In the arrangement shown the flanges of the two pipes to be coupled are held together by hook members which are distributed around the coupling and arranged in pairs each pair being operated by a single servo device. The hook members, indicated by the reference 26, are pivoted at 27 on brackets 28 projecting from the upper flange 2. The hook members 26 are provided with adjustable stops 29 which, as shown in Fig 6, engage the flange 4. The hook members are also coupled by way of links 30 with the plates 31 which are pivoted at 32 on brackets 33 projecting from the duct walling 1. Servo devices 34 are pivoted at 35 on the ends of the brackets 28; these servo devices have plungers 36 which are coupled through rods 37 with the plates 31 to which they are pivoted at 38.

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Fig. 8 shows how the supply ducts to the servo mechanisms are arranged. It will be observed that the flexible pipe 40 shown in Fig. 5 actually constitutes the line 7 of Fig. 1.

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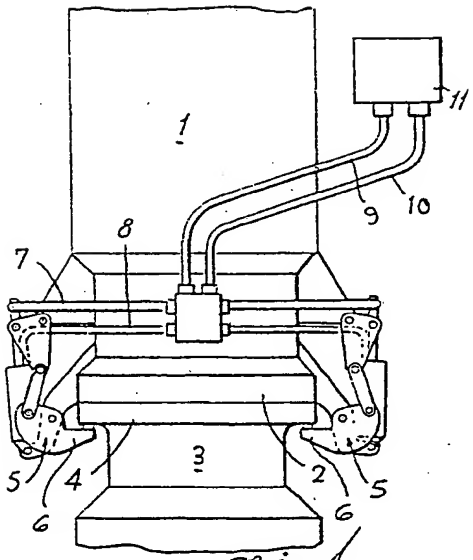

Fig. 1.

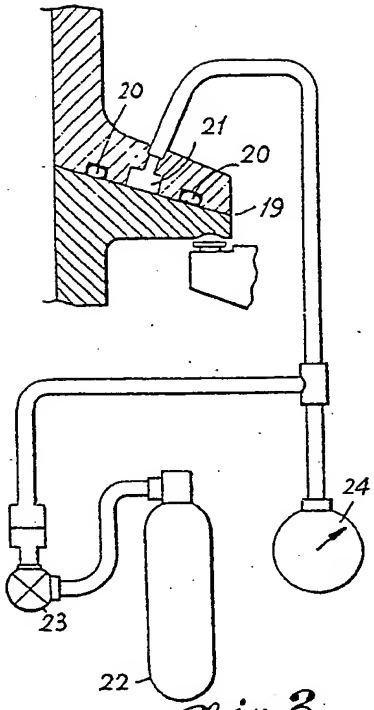

Fig. 3.

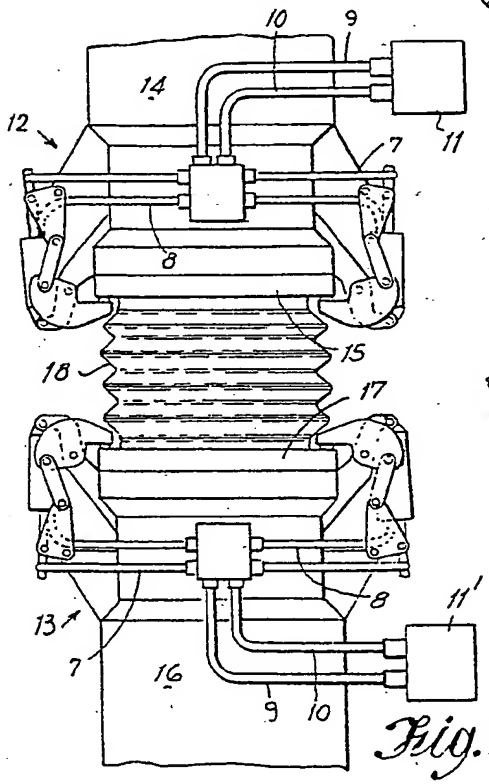

Fig. 2.

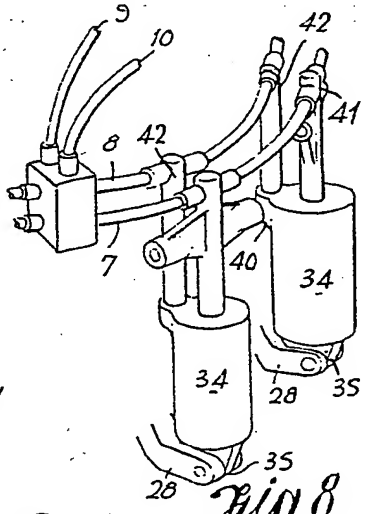

Fig. 8.

854,763 PROVISIONAL SPECIFICATION
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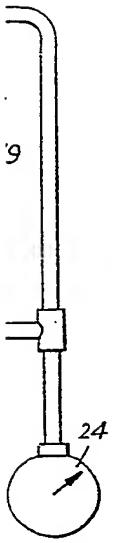
SHEETS 1 & 2



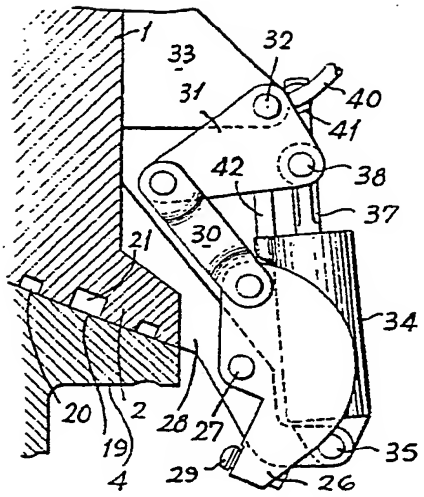
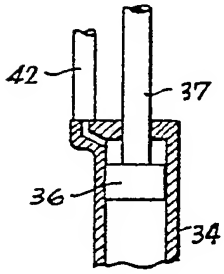


Fig. 4.

Fig. 7.



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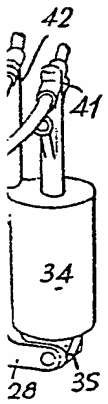

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Fig. 6.

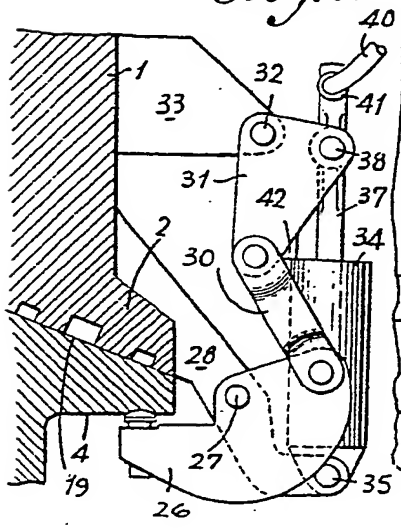

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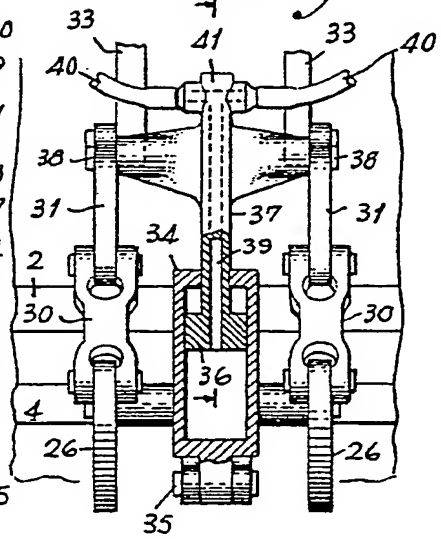
Fig. 5.



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SHEETS 1 & 2

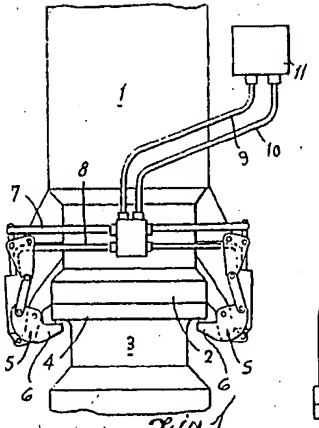

Fig.1.

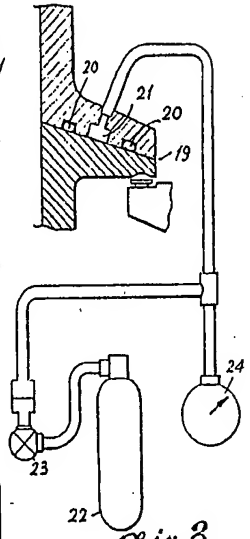

Fig.3.

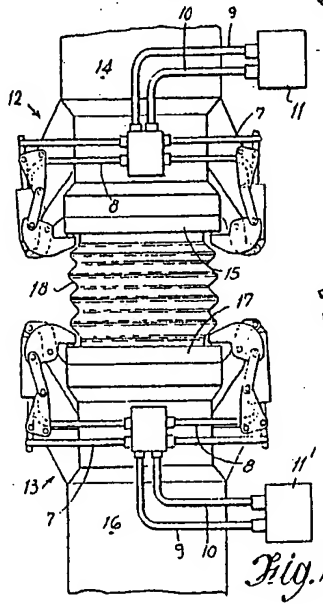

Fig.2.

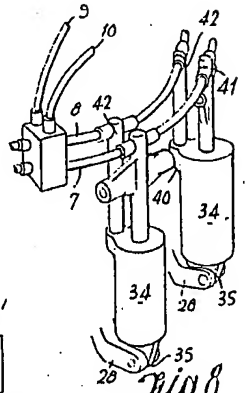

Fig.8.

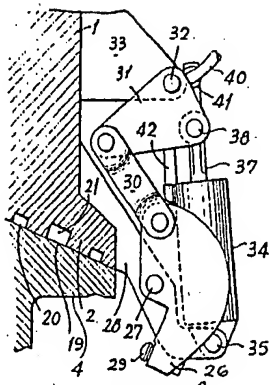

Fig.4.

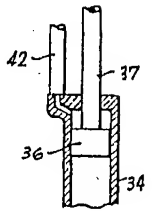

Fig.7.

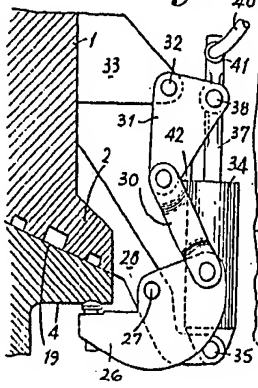

Fig.6.

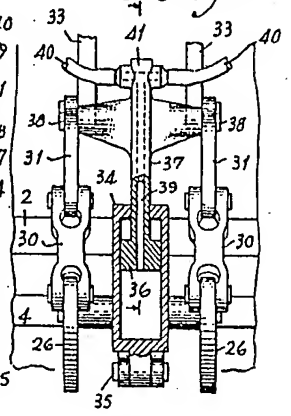

Fig.5.